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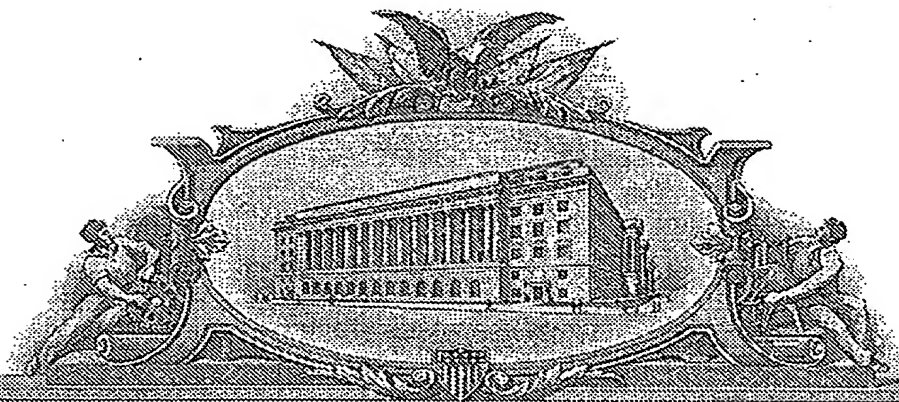
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APPLICATION NUMBER: 60/536,824

FILING DATE: *January 15, 2004*

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15866 U.S. PTO

PTO/SB/16 (08-03)

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

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INVENTOR(S)					
Given Name (first and middle (if any))		Family Name or Surname		Residence (City and either State or Foreign Country)	
Paul		OOMMEN		Irving, Texas USA	
Additional inventors are being named on the _____ separately numbered sheets attached hereto					
TITLE OF THE INVENTION (500 characters max)					
Direct all correspondence to: CORRESPONDENCE ADDRESS					
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ENCLOSED APPLICATION PARTS (check all that apply)					
<input checked="" type="checkbox"/> Specification Number of Pages 12					
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<input type="checkbox"/> Application Date Sheet. See 37 CFR 1.78					
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT					
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.					
<input type="checkbox"/> A check or money order is enclosed to cover the filing fees.					
<input checked="" type="checkbox"/> The Director is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 50-0270					
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FILING FEE Amount (\$) 160.00					
The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.					
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[Page 1 of 2]

Respectfully submitted,

SIGNATURE

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TELEPHONE 972-894-6173

Date January 15, 2004

REGISTRATION NO. 39,368

(if appropriate)

Docket Number: NC17713P

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FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$ 160.00

Complete if Known

Application Number Not Assigned
Filing Date 01/15/2004
First Named Inventor OOMMEN
Examiner Name N/A
Art Unit N/A
Attorney Docket No. NC17713P

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☒ Deposit Account:

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Deposit Account Name

50-0270

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1001 770	2001 385	Utility filing fee	
1002 340	2002 170	Design filing fee	
1003 530	2003 265	Plant filing fee	
1004 770	2004 385	Reissue filing fee	
1005 160	2005 80	Provisional filing fee	160.00

SUBTOTAL (1) (\$ 160.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

Total Claims	Extra Claims	Fee from below	Fee Paid
Independent Claims	-20** =	X	
Multiple Dependent	-3** =	X	

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description
1202 18	2202 9	Claims in excess of 20
1201 86	2201 43	Independent claims in excess of 3
1203 290	2203 145	Multiple dependent claim, if not paid
1204 86	2204 43	** Reissue independent claims over original patent
1205 18	2205 9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1051 130	2051 65	Surcharge - late filing fee or oath	
1052 50	2052 25	Surcharge - late provisional filing fee or cover sheet	
1053 130	1053 130	Non-English specification	
1812 2,520	1812 2,520	For filing a request for ex parte reexamination	
1804 920*	1804 920*	Requesting publication of SIR prior to Examiner action	
1805 1,840*	1805 1,840*	Requesting publication of SIR after Examiner action	
1251 110	2251 55	Extension for reply within first month	
1252 420	2252 210	Extension for reply within second month	
1253 950	2253 475	Extension for reply within third month	
1254 1,480	2254 740	Extension for reply within fourth month	
1255 2,010	2255 1,005	Extension for reply within fifth month	
1401 330	2401 165	Notice of Appeal	
1402 330	2402 165	Filing a brief in support of an appeal	
1403 290	2403 145	Request for oral hearing	
1451 1,510	1451 1,510	Petition to institute a public use proceeding	
1452 110	2452 55	Petition to revive - unavoidable	
1453 1,330	2453 665	Petition to revive - unintentional	
1501 1,330	2501 665	Utility issue fee (or reissue)	
1502 480	2502 240	Design issue fee	
1503 640	2503 320	Plant issue fee	
1480 130	1480 130	Petitions to the Commissioner	
1807 50	1807 50	Processing fee under 37 CFR 1.17(q)	
1808 180	1808 180	Submission of Information Disclosure Stmt	
8021 40	8021 40	Recording each patent assignment per property (times number of properties)	
1809 770	2809 385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810 770	2810 385	For each additional invention to be examined (37 CFR 1.129(b))	
1801 770	2801 385	Request for Continued Examination (RCE)	
1802 900	1802 900	Request for expedited examination of a design application	

Other fee (specify)

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$

SUBMITTED BY

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(Complete if applicable)

Date

1/15/04

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METHOD FOR A-KEY EXCHANGE AND UPDATING CRITICAL CDMA PARAMETERS

BACKGROUND

5 [0001] This invention pertains generally to communication of systems
and more particularly to IP Based Over-the-Air Device Management of
mobile stations.

[0002] There are some critical parameters used in Code Division
Multiple Access (CDMA) mobile stations (MS), which are essential for
signaling and data communication. One such parameter is the 128-bit
10 Authentication Key (A-Key) (64 bit in legacy MS). The A-key is different
from other parameters. It is known only to the Authentication Center
(AC) and the MS. While other parameters may be updated using
normal request response (IS-683 or IP based) messages, parameters
like A-Key require a secure method. IS-683 (IS-683-A and later
15 revisions) defines the method for updating A-Key in IS-95/ cdma2000
devices using signaling messages. But an IP based method for A-Key
update is not defined. Purpose of embodiments of this invention is to
describe an IP based method for A-Key update, as well as other critical
parameters in cdma2000 mobile stations.

20 [0003] The invention is related to the IP Based Over-the-Air Device
Management (IOTA-DM) work item in the 3GPP2 TSG-S standard
specification.

[0004] In CDMA systems, a special parameter called Authentication
Key (A-Key) is used for the generation of Shared Secret Data (SSD).
25 The SSD is used for the encryption of data sent in the physical layer as
well as layer 2 signaling. The A-Key is assigned to the MS in a secure
way. A method for updating A-Key is described in IS-683. But this

procedure uses signaling messages for updating A-Key and hence limited to the specific implementation.

5 [0005] There is significant interest in IP based methods for managing mobile stations over-the-air (OTA). Corresponding standards work is progressing in OMA and 3GPP2. Current versions of IP based protocols do not define a method for A-Key exchange.

SUMMARY

[0006] A method according to an embodiment of this invention provides an IP based method for A-Key exchange, and updating other critical parameters in cdma2000 mobile stations and beyond.

5 [0007] These and other features, aspects, and advantages of embodiments of the present invention will become apparent with reference to the following description in conjunction with the accompanying drawings. It is to be understood, however, that the drawings are designed solely for the purposes of illustration and not as a
10 definition of the limits of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Figure 1 is a session diagram illustrative of an embodiment of the invention wherein there is OTAF and IS-683 client in the mobile station.

5 [0009] Figure 2 is a session diagram illustrative of an embodiment of the invention wherein the mobile station does not Support IS-683-Client.

DETAILED DESCRIPTION

5 [0010] An embodiment of this invention provides a method for updating A-Key in CDMA mobile stations using the DM framework. The method can be used for the update of other critical parameters in the MS, which are not accessible using normal methods. A-Key is a critical parameter, which is known only to the Authentication Center (AC) and the mobile station. In CDMA mobile stations, the A-Key is updated using over-the-air (OTA) methods.

10 [0011] Figure 1 is a session diagram illustrative of an embodiment of the invention wherein there is OTAF and IS-683 client in the mobile station. Entities which may participate in various parts of session 100 are A-Key IS-683 Client 110, Mobile Station Management Tree 120, Mobile Station Device Management Client 130, Over The Air Device
15 Management Server 140, Over The Air Function (OTAF) Server 150. The method comprises the following when there is OTAF and IS683 client in the mobile station.

20 1001. The IS-683 Server in the network initiates the A-Key update procedure by issuing a "Key Request Message" as described in IS-683.

25 1002. The OTA-DM Server intercepts the message and buffers it. The Server then sends a notification to the MS DM client. This message is package #0 in the DM protocol, which acts as a trigger. This trigger can carry the identification "A-KET GEN", by which the MS DM Client identifies it as a trigger to begin the updating of A-Key.

1003. The MS DM Client responds with "MS Capability Message". This is a standard package #1 message in the DM protocol, but for the specific purpose of A-Key update, this message will carry new parameters to identify the capabilities of the MS. The parameter

would include if the MS supports scenario 2.1 or 2.2 described in this document.

5 1004. After receiving the "MS Capability Message", the IOTA-DM server knows which scenario to be followed, i.e. whether the subsequent messaging is for scenario 2.1 or scenario 2.2 described in this document. If it is scenario 2.1, the IOTA-DM Server creates a new message "IOTA-DM Key Request Message" by encapsulating the "Key Request message" originated from the IS-683 server as well as additional commands. One additional command is the standard "Exec" command in the DM protocol. But here the "Exec" command is executed on a special node in the MS Management Tree. This node corresponds to the A-Key in the MS. Since A-Key is stored only in the MS permanent storage or in the R-UIM/UICC, this node in the management tree is a dummy node, which does not store the value of A-Key, but points to process which the "Exec" command should execute upon receiving the "IOTA-DM Key Generation Request Message". In scenario 2.1, this process is the IS-683 client running in the MS. The "Key Request Message" received at the IOTA-DM Client can be stored in a temporary leaf node of the A-Key node, from where the invoked IS-683 client can access it.

25 1005. On receiving the "IOTA-DM Key Request Message" the MS DM Client executes the commands specified in the message. This involves executing the "Exec" command on the A-Key node in the Management Tree, which results in passing the encapsulated "Key Generation Request Message" to the IS-683 Client.

30 1006. The IS-683 Client calculates the MS_RESULT parameter based on the input parameters in the encapsulated message. The algorithm described in section 5.1 of C.S0016 Over-the-Air Service Provisioning of Mobile Stations in Spread Spectrum Systems, 3GPP2, March 2003 is followed for calculating MS_RESULT.

- 5 1007. The IS-683 Client sends the "Key Response Message" which includes the status of the MS_RESULT calculation. If an error occurred, the error code is sent in the response as described in C.S0016 Over-the-Air Service Provisioning of Mobile Stations in Spread Spectrum Systems, 3GPP2, March 2003.
- 10 1008. The "Key Response Message" is intercepted by the IOTA-DM Client and encapsulated in a DM protocol message called "IOTA-DM Key Gen. Response" Message. One way is to store the "Key Response Message" in a temporary leaf node associated with the A-Key node in the management tree from where the IOTA-DM client can access it for encapsulation.
1009. The IOTA-DM Client sends the encapsulated "IOTA-DM Key Response Message" to the IOTA-DM Server.
- 15 1010. The IOTA-DM server forwards the encapsulated message to the IS-683 Server.
- 20 1011. The IS-683 Server calculates the BS_RESULT following the algorithm in section 5.2 of C.S0016 Over-the-Air Service Provisioning of Mobile Stations in Spread Spectrum Systems, 3GPP2, March 2003 and sends it to the MS in the "Key Generation Request message".
- 25 1012. The IOTA-DM Server encapsulates the "Key Generation Request Message" in a DM Protocol message and sends it to the MS IOTA-DM Client in the "IOTA-DM Key Generation Request". This message also carries the "Exec" command to invoke the IS-683 client.
1013. Executing the "Exec" command results in invoking the MS IS-683 client process.
1014. The IS-683 client calculates the A-Key from the BS_RESULT.

1015. The IS-683 Client now sends the MS_RESULT calculated in step 6 in the "Key Generation Response Message. The message is encapsulated in the IOTA-DM message. This can be achieved by the IS-683 client first storing the message in a temporary leaf node of the A-Key node and then the IOTA-DM client accessing it.

1016. The IOTA-DM server forwards the MS_RESULT to the IS-683 Server.

1017. The IS-683 server computes the A-Key and issues a commit message.

1018. The IOTA-DM server directs the commit message to the MS IOTA-DM client.

1019. The MS IOTA-DM client forwards this message to the IS-683 client. On receiving the commit the IS-683 Client stores the A-Key in a permanent memory.

1020. The IS-683 client now sends a "Commit response".

1021. The commit response is encapsulated in the "IOTA-DM Commit Response".

1022. The IOTA-DM server forwards the encapsulated message to the IS-683 server.

[0012] The IS-683 server can now update the A-Key in the AC.

[0013] Figure 2 is a session diagram illustrative of an embodiment of the invention wherein the mobile station does not Support IS-683 Client. Entities that may participate in various parts of session 200 are A-Key Client 210, Mobile Station Management Tree 220, Mobile Station IP Based Over-the-Air Device Management Client 230, IP Based Over-the-Air Device Management Server 240, and Authentication. The method

comprises the following when there the mobile station does not support IS-683 client.

2001. The Authentication Center (AC) initiates a trigger to update the A-Key in the MS.

5 2002. The IOTA-DM server begins a notification-initiated session by sending a notification message with data "A-KEY GEN".

2003. The IOTA-DM client responds with package #1 carrying the MS capability information. This enables the DM Server to tailor the contents according to the capabilities of the device. Step 4. onwards
10 assume that the device is SyncML DM capable.

2004. The IOTA-DM server creates Key Request message and sends it to the MS Client in DM Protocol [2] message. The message includes the input parameters mentioned in section 5.1.2 of C.S0016 Over-the-Air Service Provisioning of Mobile Stations in Spread
15 Spectrum Systems, 3GPP2, March 2003.

2005. The IOTA-DM client executes the Exec command in the message. The Exec command carries information about the process to be invoked for calculating A-Key. The process can be integrated to the IOTA-DM client, in which case a separate A-Key Client is not
20 required. The parameters from the message received in step 4 is provided as input parameters to the A-Key client.

2006. The A-key client computes the MS_RESULT parameter.

2007. The result code is send in the Key Response message.

2008. The IOTA-DM Server computes the BS_RESULT (See
25 procedures in 5.2.1 of C.S0016 Over-the-Air Service Provisioning of Mobile Stations in Spread Spectrum Systems, 3GPP2, March 2003).

2009. The IOTA-DM Server sends the BS_RESULT to the MS client in a "Key Generation Request Message".

2010. The IOTA-DM client passes the parameters to the A-Key Client.

5 2011. The A-Key client computes the A-KEY following the algorithm described in section 5.1 of C.S0016 Over-the-Air Service Provisioning of Mobile Stations in Spread Spectrum Systems, 3GPP2, March 2003, based on input parameters in step 4 and the BS_RESULT from step 9. The value can be stored in a temporary location in the management tree.

10 2012. The IOTA-DM Client sends the "Key Generation Response Message". MS_RESULT computed in step 6 is send in this message to the IOTA-DM Server.

15 2013. The IOTA-DM Server computes the A-Key based on MS_RESULT, following the algorithm in section 5.2 of C.S0016 Over-the-Air Service Provisioning of Mobile Stations in Spread Spectrum Systems, 3GPP2, March 2003.

2014. The DM Server sends a "Commit Message" to the IOTA-DM Client.

20 2015. On receipt of the commit request, the IOTA-DM client invokes the A-Key client to store the A-Key stored in temporary node of the management tree to the permanent memory A-KEYp and removes the A-Key from temporary storage.

2016. The IOTA-DM client sends the status of in the commit response message.

25 2017. The IOTA-DM server updates the A-Key to the Authentication Center (AC).

[0014] Although described in the context of particular embodiments, it will be apparent to those skilled in the art that a number of modifications and various changes to these teachings may occur. Thus, while the invention has been particularly shown and described with respect to one
5 or more preferred embodiments thereof, it will be understood by those skilled in the art that certain modifications or changes, in form and shape, may be made therein without departing from the scope and spirit of the invention as set forth above.

ABSTRACT

[0015] A method according to an embodiment of this invention provides an IP based method for A-Key exchange, and updating other critical parameters in cdma2000 mobile stations and beyond.

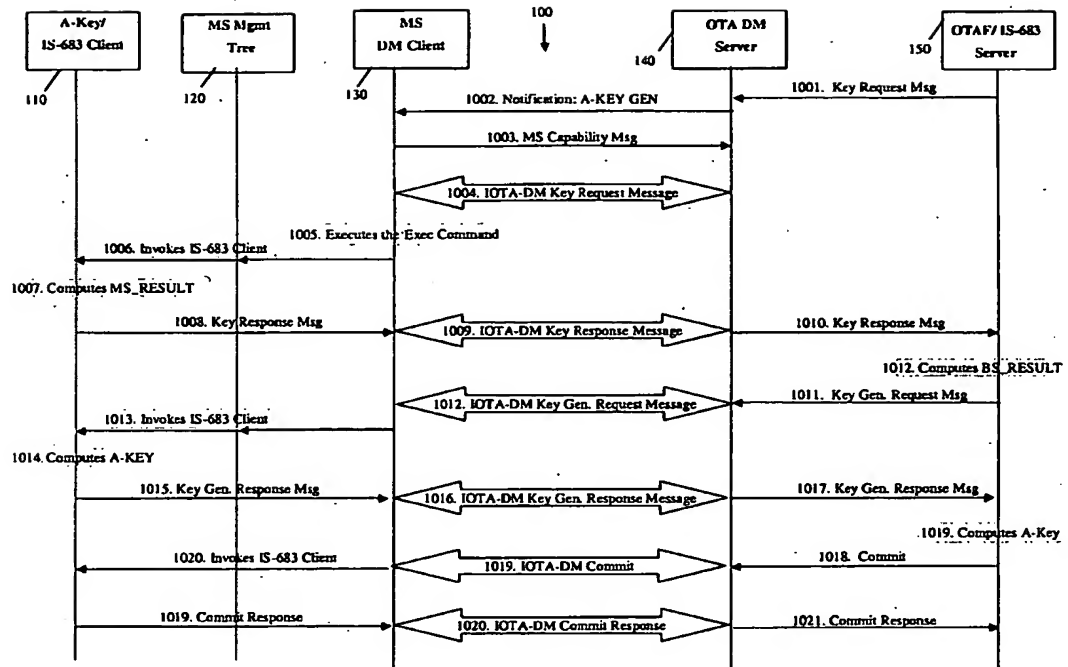


FIGURE 1

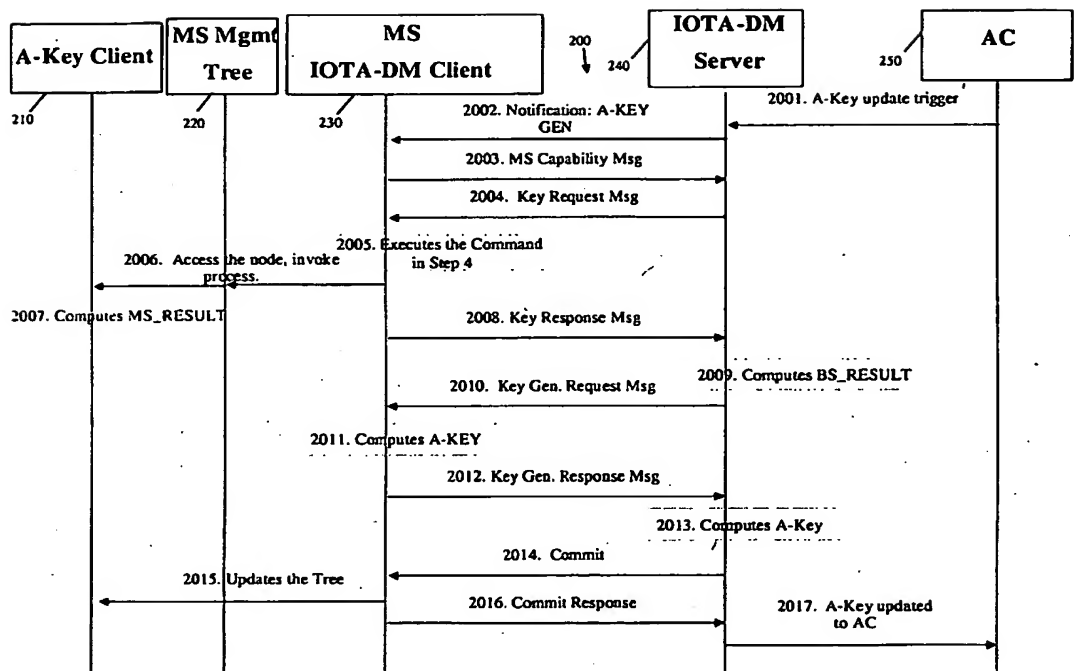


FIGURE 2